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INSTITUTE OF GAS TECHNOLOGY

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GAS ABSTRACTS

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1. GAS INDUSTRY

Appliances

Hobson, S. C. TWENTY PER CENT SALES INCREASE EXPECTED IN 1950. *Gas Age* **150**, 23, 60-61 (1950) *January* 5.

Gas appliance manufacturers anticipate sales increases in 1950 bringing total sales approximately to the all-time records set in 1947-1948. Sales of gas ranges and gas-fired central heating equipment are expected to increase 20-30% over those in 1949. Substantial gains in sales of other appliances are also anticipated.

J. C. Lane

British Gas Industry

Greenwood, H. D. THE PRODUCTION AND UTILIZATION OF COKE OVEN GAS. *Gas World* (British) **131**, *"Supplement"* 2-10 (1950) *January* 7.

In 1947, British coke ovens owned by the National Coal Board, by independents and by iron and steel firms produced 216,400 MMcf of gas. Of this 53,000 MMcf was sold to gas undertakings, 101,200 MMcf used in oven heating and the remainder for industrial heating. With the estimated increase in blast furnace coke requirements up to 1953/1954, an additional 15,000 MMcf of gas is anticipated. From 322,086 MMcf in 1938, total gas sold has grown to 446,086 MMcf in 1948, about 5% average increase per year. Coke oven gas purchased by gas works has increased steadily at about 7% per year during this time. More economic utilization of present and potential supplies of coke oven gas might make possible a considerable saving in new capital required for gas works equipment. Economics of the Ruhr and the proposed South Wales gas grids are discussed in considerable detail.

O. P. Brysch

Gas Industry Review

Cuthrell, H. H. MIRROR OF 1949. *Gas* **26**, 27-30 (1950) *January*; GAS INDUSTRY REACHES NEW HEIGHTS IN 1949. *Gas Age* **150**, 19-22, 57-59 (1950) *January* 5.

Statistics indicate that 1949 was an all-time record year for the gas industry, with new records being set in almost every statistical category. The American Gas Association's PAR plan expenditures totaled nearly $7.75 million at the close of the fifth year of the plan on September 30. Other activities of the A.G.A. are enumerated.

J. C. Lane

Hulcy, D. A. NATURAL GAS INDUSTRY CONTINUES ITS DYNAMIC GROWTH. *Gas Age* **150**, 24-25 (1950) *January* 5.

The natural gas industry now enjoys an unprecedented demand for its product. However, the vast expansion of facilities now in progress must be projected, financed and carried out with the same heed to sound economic principles as if the industry had to compete for the market. Capital must be complemented with well trained personnel. Companies should inform the workers of the employee benefits provided. Other cautions to observe include: reasonably conservative debt ratios; continued consciousness of potential competition, such as between electricity and gas for the cooking load; changes in regulatory and taxation legislation. Taxation to discourage the "exportation" of natural gas from the producing states is a possibility which must be considered.

J. C. Lane

GAS INDUSTRY REVIEW. *Oil Gas J.* **48**, 41 (1949) *December* 29.

Sales of natural gas by utility companies increased approximately 8% in number of customers, 9% in volume and 10% in revenues during 1949 as compared with 1948. More than half a million new customers were added to gas utility lines. Sales and revenues reached new all-time levels. Capital expenditures for construction and expansion totaled nearly one billion dollars, breaking all previous records. Salient statistics on 1949 operations are reported.

J. C. Lane

LP-Gas

Mattocks, E. O. and Rugh, K. W. LP-GAS SURVEY. *Oil Gas J.* 48, 28-29 (1950) *Jan.* 5.

Sales of liquefied petroleum gas totaled 2,725,000 gallons in 1949, 8.5% above sales in 1948. Annual sales gains have been 25-30% in recent years. While the rate of growth has slowed, the future outlook is good. Some 6,500,000 homes not on gas mains are served by bottled gas.

J. C. Lane

10-YEAR FORECAST. *Butane-Propane News* 12, 37-39 (1950) *January.*

Expansion of the LP-gas industry to annual sales of 2.6 trillion gallons by 1960 has been predicted. Average use per customer by that time is estimated at 31.5 gallons per month, compared with present use of 23.3 gallons. Charts of predicted competitive positions as measured by number of customers are presented.

J. C. Lane

Pipe Lines

NEW PIPE LINES PLANNED TOTAL 32,266 MILES; 14,877 MILES LAID IN 1949. *Pipe Line News* 22, 23-25, 29 (1950) *January.*

Natural gas pipe line laid during 1949 totaled 9,141 miles. Natural gas lines planned or under construction total some 20,600 miles. The projects planned for 1950 are tabulated.

J. C. Lane

1949—BOOM YEAR FOR GAS PIPELINES. *Gas* 26, 79-80, 82-83 (1950) *January.*

During 1949, some 6,475 miles of major pipe line construction was authorized by the FPC. The total cost of these projects amounted to more than $556 million. In addition, many temporary permits were issued. With the 34-in. "Super Inch" line underway from San Francisco to west Texas and with lines building or projected to deliver gas to New York, New Jersey and New England, 1950 promises to be another boom year for pipe lines.

J. C. Lane

Prices

Duff, D. M. EASTERN FREE FOR ALL. *Oil Gas J.* 48, 26-27 (1950) *January* 5.

As natural gas becomes increasingly available in the northeastern United States, it is expected to offer serious competition to oil and coal in the nation's top fuel market. Natural gas at 7-8 cents per therm in the New York area would compete on a heating value basis with oil at 10 cents a gallon and coal at $16.70 a ton. More than 45% of all oil house-heating units are in New York, New Jersey and New England. Natural gas is expected to "skim the cream" of this market, particularly as regards new construction and replacements of obsolete automatic heating units. Manufactured gas plants in New England, New York, New Jersey and Pennsylvania used 885,970,000 gallons of oil during 1948. The use of natural gas for enrichment will substantially reduce that market.

J. C. Lane

Stormont, D. H. MINIMUM GAS PRICES. *Oil Gas J.* 48, 38 (1950) *January* 12.

Suggestions for establishing minimum field prices for Texas natural gas are increasing. Another suggestion is that gas prices be posted by districts, counties or fields as is done in the case of crude oil. The average price of Texas natural gas increased from 3.21 cents per Mcf in 1946 to 4.36 cents in 1947, 5.33 cents in 1948 and about 6.2 cents in 1949.

J. C. Lane

Regulation

Lippitt, H. F. IS THE FPC ENCROACHING ON LOCAL GAS REGULATION? *Public Utilities Fortnightly* 45, 13-25 (1950) *Jan.* 5.

The Federal Power Commission has repeatedly contended that it possesses the right to regulate any company selling natural gas transmitted from a producing state to a consuming state, whether or not the selling company does any business outside its own states and regardless of the fact that a state regulatory commission exists for this purpose. In most cases the FPC has been able to apply such regulation either

through court decisions (Illinois Natural Gas and Colorado-Wyoming cases) or through the reluctance of the companies involved to risk prolonged costly litigations. The East Ohio Gas Company case, about to be decided, will determine whether FPC may regulate the operations of a company exclusively engaged in the distribution of natural gas within the borders of a single state for local service sales and not resale. Some legislative correction is necessary if the system of state supervision of local gas distribution companies is not to be superceded by Federal regulation.

J. C. Lane

Synthetic Fuels

Weber, G. SYNTHETICS REVERSE. *Oil Gas J.* 48, 23 (1950) *January* 5.

Standard Oil Development Company and Pittsburgh Consolidation Coal Company have discontinued operation of their jointly owned coal-to-oil pilot plant at Library, Pa. and have deferred indefinitely any commercial development of the synthesis process. The uncertainty of coal availability and cost with labor relations what they are in the coal industry was cited as the main reason for such action. The results obtained in 15 months of pilot plant operation reportedly demonstrated that the fluid technique is adapted to synthesis gas production and that the synthesis gas can be successfully converted to tar-free high-Btu gases, gasoline and other Fischer-Tropsch products. However, the economics of the process are not favorable at this time with coal at a record high cost and petroleum available for all demands.

J. C. Lane

2. APPLIANCES

Burners

Davis, K. (assigned to Affiliated Gas Equipment, Inc.) GAS CONTROL MEANS. U. S. 2,490,420 (1949) December 6.

Five claims were allowed for relatively simple means for modulating the flow of gas to the burner of a heating appliance by utilizing a main gas valve, a motorized valve and a double contact type of thermostat.

E. F. Davis

Grumer, J. PREDICTING BURNER PERFORMANCE WITH INTERCHANGED FUEL GASES. *Ind. Eng. Chem.* 41, 2756-2761 (1949) *December.*

A method for predicting burner performance on a distribution system supplied with supplementary gas is proposed. Flame-stability diagrams defining the regions of flash back and blow off for the base gas and the supplemental mixture are required. Additional data on air entrainment are obtained by calculation. To illustrate, the flame-stability diagram for the base gas defines a region of satisfactory performance, in terms of primary mixture composition and "critical velocity gradients" at flash back and blow off. All burners which are operating satisfactorily on the system are included in this region of performance. From these limits for the base gas, the limits of the performance region for the supplemental mixture are calculated by means of the equations for velocity gradients, air entrainment and orifice flow capacity. The calculated limits define a region of performance which includes all the burners on the system previously adjusted on the base gas and now supplied with supplemental gas. These performance limits are compared with the flame stability limits for the supplemental gas to predict the interchangeability characteristics of the two fuels.

A. J. Rudnitzki

Drying

Schetty, T. CONTINUOUS DYEING AND FINISHING OF NARROW FABRICS. *Ind. Gas* 28, 3-4 (1949) *December.*

A description is given of a continuous vat dyeing machine which employs a gas-fired air heater for drying. Speed and reproducibility are given as advantages.

E. F. Davis

Incinerator

Baggs, J. W. GAS FUME INCINERATOR ENDS PLANT'S OBJECTIONABLE ODORS. *Gas* 26, 39 (1950) *January.*

The gas and vapor from an asphalt oxidizing tank are burned in a checkerbrick furnace which is heated with natural gas. Unique feature of this system is an adjustable gas port which prevents flashback into the oxidizing tanks. The objectionable odors and vapors are completely eliminated.

E. F. Davis

Ranges

Smith, L. H. DESIRABLE FEATURES IN GAS COOKERS. *Natl. Gas Bull.* (Australia) 13, 18-23 (1949) *September-October.*

The author lists the desirable features of a gas cooker, consistent with reasonable cost to the consumer as follows: (1) safe and efficient performance of hot plate burners and oven; (2) pleasing streamlined design; (3) durable construction; (4) an efficient griller of adequate dimensions; (5) convenience in use by housewife; (6) thermostatic control; (7) reliable components; (8) a well fitting oven door; and (9) ease of installation and servicing.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Downjet Furnace

Ross, F. F. and Sharpe, G. C. H. THE BURNING OF COKE BY THE DOWNJET METHOD. *J. Inst. Fuel* (British) 23, 20-24 (1950) *January.*

Various arrangements of coke burners using the downjet principle are described. The principal types are fuel feeds under a front arch which give up to 75 lb/hr rating, and feeds down a central water-cooled bin-chute (to form a conical fire bed) which give up to 100-150 lb/hr rating. Air is supplied through a carefully designed nozzle at from 3 to 14 in. water gage to give a jet velocity of 75 to 225 ft/sec. Adjustment of velocity permits the attainment of 19 to 19.5% CO_2 in the exit gases. Main combustion zone is 2 to 3 layers below the surface, but the producer-gas reaction consumes fuel deeper in the bed. The liquid ash solidifies about 12 particle diameters below the air nozzle, where it accumulates slag from above to form a lens shaped "clinker". This clinker may be removed by supporting the fuel bed above with retractable pins, and allowing the clinker to drop downward or be shoved sideways into a quenching chamber, after which any accompanying coke may be separated and returned to the feed. Although small in dimensions, the downjet is not suitable for small (domestic) outputs, but has been successfully applied to steam generation, high-temperature kilns, medium-temperature metal reheating and annealing, low temperature drying and annealing. Gas temperatures of over 1700° C have been reached using cold air, in a refractory test kiln. Excellent diagrams and photographs of the installations and their details are given.

O. P. Brysch

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Grumer, J. PREDICTING BURNER PERFORMANCE WITH INTERCHANGED FUEL GASES. p. 19

4. CARBONIZATION AND GASIFICATION

Briquetting

Maunder, D. J. BRIQUETTING AS A SOLUTION TO THE BREEZE PROBLEM. *Gas J.* (British) **260**, 723, 726-727, 730 (1949) *December* 21.

A description is given of the Torquay briquetting plant. Coke breeze (88% by wt) of minus $^{3}/_{16}$ in. size and pitch (12% by wt) of softening point 60 to 75°C are reduced to minus $^{3}/_{16}$ in. size and intimately mixed in a pan mill. The mixture is conveyed to a fluxer, in which it is stirred by rabble arms and heated to 90°C by jets of superheated steam. The stiff, semiplastic material is cooled to 70°C, and molded by press rolls at a pressure of 1100 psi. Although the resulting briquetts have been used successfully as boiler and domestic grate fuel, the physical properties are improved by coking prior to ignition.

W. E. Ball

By-Product Coking

ECONOMIC FACTORS IN BY-PRODUCT COKING. *Coke & Gas* (British) **11**, 411-414, 423 (1949) *December*.

Dr. Ing. W. Reerink brought out the following points in a recent paper on the economic position of the German by-product coking industry. The average revenue is made up as follows: coke, 73.0%; gas sales, 11.5%; benzol, 8.0%; tar, 4.5%; and ammonia, 3.0%. There appear to be only slender possibilities for increasing the revenue from coke by producing an improved quality or special types. Efficient disposal of surplus oven gas is hampered by a deficiency in storage capacity, weekly load fluctuations being handled by operation of uneconomic coke-fed gas producers for oven heating. Since the present production cost of ammonium sulfate is 50% higher than the income, the author is of the opinion that plants should not commit themselves to the recovery of ammonia exclusively as sulfate. Ammonium humate, which utilizes peat as a base, has been demonstrated to be an efficient fertilizer. New products, such as pyridine, thiocyanate and hydrogen cyanide are possible additional sources of income. The operating cost distribution is given as: coal cost, 71.8%; gas for underfiring, 10.9%; energy and fuel, 5.2%; labor, 4.8%; other, 7.3%. Hard coke may not be needed for reduction of iron ore in the future. Processes mentioned include direct reduction with water gas, and a two-stage process consisting of treatment of briquettes, made from low-temperature char and ore, in a small furnace blown with oxygen.

W. E. Ball

Coal Properties

Flynn, G. J., Jr. AVERAGE HEATING VALUES OF AMERICAN COALS BY RANK AND BY STATES. U.S. Bureau of Mines Information Circular 7538 (1949) *December*.

Heating values for coals of the U.S. from published sources were averaged arithmetically by seam for each county and these averages were weighted according to 1944 production for the counties of a given state to obtain the average as received Btu for the state. The average of each state was weighted similarly and the national average for each rank of coal was determined. Three tables and a list of Bureau of Mines coal analyses publications are given.

O. P. Brysch

Coke Ovens

Puening, F. and Bower, A. L. (assigned to Bethlehem Steel Co.) SEALING DEVICE FOR COKE OVENS WITH MOVABLE WALLS. U.S. 2,490,090 (1949) December 6.

Sealing means for an oven chamber are described which consist of a continuous flexible water-filled trough around the top of the chamber, into which trough a bell-cover is lowered to form a seal. The vertical ends of the chamber are sealed by flexible metal plates pressed against the structural frame plates, these flexible seal-plates engaging at their tops with the bell-cover to form a gas-tight seal.

O. P. Brysch

Conversion

Johnson, G. B. GAS CONVERSION EXPERIENCES. *Gas Age* **104**, 38-43, 62, 65-66, 68, 70 (1949) *December* 22.

This paper relates the experiences of two gas conversions. The first conversion was made from manufactured gas to an 800 Btu mixed gas and the second from mixed gas to natural gas. The first conversion was made by the pressure method while in the second conversion an intermediate gas was supplied until the conversion was completed. Details of port area, orifice sizing, material and manpower required, are discussed along with a breakdown of costs.

E. F. Davis

Mackie, F. D. DISTRIBUTION SYSTEM IS SECTIONALIZED FOR CONVERSION TO NATURAL GAS. *Am. Gas J.* **171**, 30-32 (1949) *December.*

The procedure used by Madison Gas and Electric Company, Madison, Wisconsin in converting their distribution system from manufactured gas to natural gas is described in detail. The system was sectionalized and the sections were converted one at a time to natural gas.

O. T. Bloomer

Distribution

Kalff, A. A NEW PLUG COCK. *Natl. Gas Bull.* (Australia) **13**, 6-7 (1949) *September-October.*

A gas cock, whose plug has a rounded side instead of the normal straight side, is claimed to be non-sticking and leak proof.

E. F. Davis

Effluents

Priestley, J. J. TREATMENT OF EFFLUENT LIQUORS FROM GASWORKS. *Gas J.* (British) **260**, 532, 537-539 (1949) *November* 30; *ibid.* 594, 599-600 (1949) *December* 7; *ibid.* 659-660, 665-666 (1949) *December* 14.

The growth of the effluent problem over the past 25 years is discussed together with reasons for that growth. The influence on the economics of disposal made by recent legislation regarding the discharge of effluents into sewers and rivers by an expanding industry is described. Reasons for the objectional nature of effluents are recapitulated and the formation and properties of individual constituents are reviewed in detail. The limitations of the oxygen absorption (O/A) value of liquors and constituents as a criterion of 'strength' are given. The various methods which may be used for reducing the production, improvement after production and finally complete disposal are described. Then follows an account of modern plants under construction — namely, dephenolation plants using butyl acetate for the solvent extraction of phenols and the Tingley scheme for the complete disposal of effluents with the production of saleable commodities. Some new laboratory work is described and the suggestion made that mutual advantage would result from closer cooperation at national level of authorities concerned with the production and disposal of effluents.

Author's abstract

Gas Generator

Madeheim, H. CONTINUOUS GAS GENERATOR SHOWS PROMISE IN BASE LOAD AND STANDBY OPERATIONS. *Am. Gas J.* **172**, 8-11, 44 (1950) *January.*

Gas compositions from operation with a silicon carbide tube furnace and feed stocks ranging from natural gas to gas oil are given. The furnace consists of 3 tubes 28 ft long and 4 in. inside diameter in an oil or gas multiply-fired 5 ft. shell. The Gas Machinery Company who designed, constructed and operated this continuous gas generator claims that it is adaptable to catalytic reforming of feed stocks up to and including straight-run gasoline as well as straight oil gas production with gasoline or gas oil. No operating data or thermal efficiency data are presented. A capacity of 20 Mcf per hr is given but the corresponding feed-stock and operating conditions are not indicated. Possible operating temperatures up to 3000°F are claimed. The furnace is designed for noncyclic, semi-automatic operation and increase in capacity by increasing the number of tubes is suggested.

H. R. Linden

High Btu Gas

Henry, H. M. HIGHER BTU GAS FROM EXISTING PLANTS SHOWS SUBSTANTIAL ADVANTAGES. PART I—FROM 528 BTU TO 660 BTU. *Am. Gas J.* **171**, 17-19, 42 (1949) *November;* PART II—FROM 660 BTU TO 951 BTU. *ibid*, 19-21 (1949) *December; Am. Gas Assoc. Monthly* **31**, 25-7, 58-59 (1949) *November, ibid.* 29-31, 48 (1949) *December; Gas Age* **104**, 17-22, 50-51 (1949) *November.*

Two examples are given of how problems of increasing distribution and production capacities were solved by increasing the gas heating value from 528 Btu. The results of an economic study which led to the adoption of a 660 Btu carburetted water gas by the Dedham and Hyde Park Gas Company and two divisions of the Worcester (Massachusetts) Gas Company and the adoption of a 951 Btu oil gas by the Cambridge (Massachusetts) Gas Company are discussed in detail. A breakdown of the actual conversion costs is given. Conversion resulted in a 25% increase of production and distribution capacities for the 660 Btu gas and a 70-80% increase for the 951 Btu gas.

H. R. Linden

Purification

Gollmar, H. A. (assigned to Koppers Co., Inc.) GAS PURIFICATION PROCESS. U.S. 2,490,-799 (1949) December 13.

Hydrogen sulfide is removed from gaseous mixtures by contacting it with an alkaline absorbent solution. Actification of the spent solution is carried out in a separate tower by aeration at a vacuum in excess of 250 in. of water. The vacuum modification reduces the volume of fouled air to be disposed of, increases the capacity of the actifier, and is claimed to minimize the formation of thiosulfate. Part of the power for producing the reduced pressure is obtained by expansion of the inlet air in an expansion engine.

W. E. Ball

Shaw, J. A. (assigned to Koppers Co., Inc.) GAS PURIFICATION PROCESS. U.S. 2,490,-840 (1949) December 13.

A method is described for removing sulfur compounds such as CS_2, COS, and mercaptans from fuel gases by means of countercurrent scrubbing with a hydrocarbon solvent containing dissolved amines such as piperidine, morpholine, or a mixture of hydrogenated tar bases. A means for effecting efficient sulfur removal using the less basic amines or lower concentrations of the more basic amines by introducing a liquid delay tank to increase reaction time is claimed. Also claimed is a system for continuous amine revivification comprising: (1) extracting amine complexes from the hydrocarbon solvent with water; (2) decomposing the extracted amine complexes with acid to release absorbed sulfur compounds; (3) springing the amine from the amine salt with alkali; and (4) distilling to recover free amine.

H. Hakewill

Underground Gasification

Gumz, W. SOME NOTES ON THE UNDERGROUND GASIFICATION OF COAL. *Combustion* **21**, 53-55 (1949) *December.*

Results of the U.S. Bureau of Mines experiments at Gorgas, Alabama confirm other underground gasification tests in Russia, Belgium and Italy in so far as concerns a low gas calorific value. Calorific values of the order of 40-50 Btu/cu ft with accompanying CO_2 content of 15% obtained with air injection represent a thermally uneconomical gasification. The inefficient results are attributable to: (a) low ratio of exposed coal surface to flowing gases; (b) excessive length of combustion and gas mixing path; and (c) high ratio of heat loss to exposed coal surface with resultant low gasification temperature levels. Suggested methods for improving the process include: (a) possible preheat of air blast; (b) the use of an inhibitor to prevent the formation of high CO_2 concentrations by secondary combustion; and (c) a basic change in method of attack such as by underground heat production combined with a steam boiler or gas turbine or by construction of a mechanized underground producer.

C. Von Fredersdorff

Vertical Retort

Burns, J. and Weston, F. R. PHASES IN THE DEVELOPMENT OF THE RECTANGULAR TYPE OF CONTINUOUS VERTICAL RETORT. *Gas World* (British) 130, 1966-1970 (1949) *December* 10; *ibid*, 2002-2006 (1949) *December* 17.

By comparison of the gas making results of retorts built since 1912 at three continuous vertical retorts plants the authors show that a continuous taper of the minor axis from 10 in. at top to 20 in. at the discharge, with very small taper in the major axis, of 2 sizes (82 in. and 103 in.) of retorts of 26 ft height, has resulted in improved gas making efficiency and smoother coal travel. Earlier studies of completely charged, quickly quenched retorts showed that diminished taper caused irregular coal travel, increased bulk density of coke, and increased wear of walls. Latest designs propose to introduce a 6-in. taper in the major axis for the top 15 ft of the retort to attain even smoother coal travel when using expanding Durham coals. The discussion on the paper is given by four British gas engineers, who mention age of the "frozen" experimental retort and effects of coal expansion on retort practice.

O. P. Brysch

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Ross, F. F. and Sharpe, G. C. H. THE BURNING OF COKE BY THE DOWNJET METHOD. p. 20

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Absorption Plant

Lacy, F. H., Jr. and Kraft, W. H. THE CYMRIC ABSORPTION PLANT. *Calif. Oil World* 42, 3, 5, 7, 9, 11, 45 (1949) *December*, 1st issue.

Process details for the Cymric absorption plant are given. A rich oil deethanizer, single still with uncondensed vapor recycled to the rich oil deethanizer and a single product fractionator for producing stabilized gasoline and LP-gas are employed. A series of test data are reported for a wide range of lean oil to gas ratio.

J. D. Parent

Bureau of Mines

Cattell, R. A. and others. REPORT OF PETROLEUM AND NATURAL GAS BRANCH FISCAL YEAR 1948. U.S. Bureau of Mines Information Circular 7532 (1949) December.

Topics of interest to the industry in this report include: characteristics of gas-condensate fluids, gas-condensate-well corrosion, fluids for coring, productivity of high pressure gas wells, subsurface pressure instruments, secondary recovery, thermodynamic properties of hydrocarbons, natural gas transportation problems and helium production and uses. Findings of value include: (1) a method for computing the compressibility of natural gases containing considerable nitrogen has been evolved; (2) a steel containing 9% chromium has been found to be excellent for use as tubing for condensate wells; (3) a means of computing friction factors for flow in annuli in wells has been worked out; (4) some new thermodynamic data for hydrocarbons have been determined; (5) a water vapor recorder for natural gas has been designed which is reliable under certain conditions; and (6) studies of gas flow in reservoirs by means of the helium tracer technic have yielded useful data.

J. D. Parent

Abstractor's Note: One inaccuracy is the statement that the Bureau's work on hydrates was responsible for proving water in natural gas

as the cause of hydrate formation. The credit for the initial work in this field belongs to Hammerschmidt and coworkers.

Compressor Station

Bacon, T. S. AUTOMATIC COMPRESSOR STATIONS. *Oil Gas J.* **48**, 61-62 (1950) *January* 12.

The author presents advantages and disadvantages of automatically controlling compressors, and discusses the experiences of his company with such systems.

J. D. Parent

Sterrett, E. REMOTE CONTROL FOR COMPRESSOR STATION MANIFOLD. *World Oil* **129**, 250, 252 (1949) *November*.

A system for remote control of block gate valves on the suction and discharge lines connecting a compressor station to the main line is described. These valves prevent delivery of gas from the preceding station and blowback from the pressurized line in event of fire or other accidents.

O. T. Bloomer

Stormont, D. H. AUTOMATIC OPERATION AT UNITED'S DALLAS COMPRESSOR STATION. *Oil Gas J.* **48**, 58, 61, 78 (1949) *December* 29.

Through use of automatic engine speed controls and compressor loading and unloading equipment this 1,200 hp station is controlled at any desired point up to full capacity. Only two operators in place of the six who would be required for manual control are employed.

J. D. Parent

Corrosion

Eilerts, C. K., Smith, R. V., Archer, F. G., Burman, L. M., Greene, F. and Hamontre, H. C. FIELD AND LABORATORY TESTS OF SODIUM CHROMATES AND ALKALIES FOR CONTROLLING CORROSION IN GAS CONDENSATE WELLS. PART V. ANALYSIS OF FIELD TESTS RESULTS. *World Oil* **129**, 156-158, 162, 164, 166, 168, 170 (1949) *November*.

The summarized results of field tests on a gas condensate well are discussed. Several facts were emphasized: (1) appropriate dilute solutions of sodium chromate and sodium hydroxide when injected into the well caused no appreciable deposits of reduced chromates on the tubing; and (2) there seemed to be no consistent relationship between chromate consumption and gas flow or water injected.

B. E. Hunt

Dehydration

Francis, A. W., Jr. and Maher, J. L. AUTOMATIC PACKAGE UNITS FOR DEHYDRATION. *Oil Gas J.* **48**, 70-72 (1950) *January* 5.

Factors to be considered in the design of package dehydration units are presented in considerable detail.

J. D. Parent

Riley, M. L. OPERATING AND DESIGN FEATURES OF ABSORPTION-TYPE DEHYDRATORS. *World Oil* **130**, 184-186 (1950) *January*.

The author outlines a procedure for selection of size of vessel for dehydration of gas with the activated alumina type of dessicant.

J. D. Parent

Gasoline

Stark, E. L. INSTRUMENTATION FOR LIGHT-ENDS FRACTIONATION. *Oil Gas J.* **48**, 62-65 (1950) *January* 19.

Instrumentation for the raw gasoline fractionation section of Arkansas Fuel Oil Company's plant at Magnolia, Arkansas is explained in some detail.

J. D. Parent

LP-Gas

Clifford, E. A. A PRACTICAL GUIDE TO LP-GAS UTILIZATION. PART X. SIZING LP-GAS CONTAINERS. *LP-Gas* **10**, 35-37, 40-42, 44, 46, 48 (1950) *January*.

By determining the maximum capacity of all appliances to be used on an LP-gas storage system and using an appliance load factor to determine the maximum rate of use the cylinder capacity required can be determined. The size must also be checked to see that there will be

sufficient heat to vaporize the liquid at the required rate. Tables and charts are given to simplify the procedure.

E. F. Davis

Nitrogen Free-Natural Gas

McCarthy, E. L., Boyd, W. L. and Reid, L. S. WATER VAPOR CONTENT OF ESSENTIALLY NITROGEN-FREE NATURAL GAS SATURATED AT VARIOUS CONDITIONS OF TEMPERATURE AND PRESSURE. *Oil Gas J.* **48**, 59 (1950) *January* 5.

A chart is presented for saturation humidity of nitrogen free natural gas in the temperature range of —70 to +280°F and for pressures of atmospheric up to 6,000 psi.

J. D. Parent

Odorization

Covell, P. L. EXPERIENCE IN ODORIZATION SHOWS NEED FOR STANDARDIZED PROCEDURES. *Am. Gas J.* **171**, 27-29 (1949) *December*.

The experience of the Minneapolis Gas Company with various types of odorizers and with concentrated and dilute odorants is reviewed. Recommendations with respect to equipment installations and operating procedures are made.

A. J. Rudnitzki

Pipe Lines

Kastrop, J. E. SUBMERGED-ARC WELDING SPEEDS DOUBLE-JOINTING 30-INCH PIPE IN THE FIELD. *World Oil* **129**, 226-227, 230, 232 (1949) *November*.

Submerged arc welding has been applied to double jointing 30 in. diameter pipe in the field. Two 31 ft sections are joined to form a 62 ft section, thus eliminating almost half the hand welds required. Details of the method and equipment are given.

O. T. Bloomer

Kastrop, I. E. THE TRANSCONTINENTAL GAS PIPE LINE. *World Oil* **129**, 187-191 (1949) *November*.

The author gives an interesting account from financing to construction of the Transcontinental Gas Pipe Line Corporation large pipe line which will extend from the lower Rio Grande Valley to New York City. The line which is scheduled for completion early in 1951 will cost an estimated $242 million.

O. T. Bloomer

Lee, C. E. A STUDY OF PIPE THREADS AND PIPE DOPES. *Gas* **25**, 39-42 (1949) *December*.

Results of a study on the causes of leaks in threaded joints are presented. The study included: (1) the accuracy of commercial pipe threads and the effect of inaccuracies on leakage; (2) a study of the sealing ability of various types of thread dopes; and (3) methods of make-up of the joints. It is concluded that the possibility of reducing the number of leaks in threaded fitting lies mainly in getting better quality and more uniform threads. Specific data on thread dopes is not given.

O. T. Bloomer

Scott, G. N. FIELD PERFORMANCE OF MODERN ASPHALTIC PIPE COATINGS. *Oil Gas J.* **48**, 68, 71, 73, 80 (1950) *January* 12.

Methods are given and discussed for determining coating discontinuities and coating conductances. Specific cases illustrating the results of discontinuity surveys and electrical tests are given.

B. E. Hunt

Thayer, S. ENGINEERING OF PIPE LINE ANCHORS. *World Oil* **129**, 216-218 (1949) *November*.

An expansion type pipe line anchor which can be set into the earth is described. Effective hold down force, method of installation, and other data are given. These anchors are said to have considerable advantage over iron or concrete weights in holding down pipe lines when buoyant forces may be encountered.

O. T. Bloomer

DOPING EQUIPMENT USED ON WESTERN SECTION OF TEXAS GAS TRANSMISSION CORPORATION PIPE LINE. *Oil Gas J.* 48, 48, 50 (1950) *January* 5.

A wrapping and coating machine for large diameter pipe lines which uses a spray ring for applying the hot dope is now in use. Several unique features of the machine are described.

O. T. Bloomer

LARGEST GAS LINE. *Oil Gas J.* 48, 47-48 (1949) *December* 15.

Peoples Gas Light and Coke Company has announced plans to serve Chicago with a new 1,400 mile, 30 in. diameter pipe line costing about $150,000,000 and having a capacity of about 585 MMcf per day. It is to be jointly owned by Peoples and by Northern Natural. The present reserves are good for twenty years and are largely from the La Gloria and Old Ocean fields of South Texas. Plans include delivery of 285 MMcf per day to Piedmont Natural Gas Corporation.

J. D. Parent

Production

Barkis, B. TIME FACTOR IN CEMENTING. *Oil Gas J.* 48, 74, 76-77 (1950) *January* 12.

A time study of operations involved in cementing is presented.

J. D. Parent

Barnes, K. B. NEW LOGGING METHOD. *Oil Gas J.* 48, 35 (1949) *December* 29.

A new electric logging technique has been developed by Schlumberger. Intended to supplement conventional methods, it is designed to provide a more precise count of pay thickness. An explanation of the operation is offered.

J. D. Parent

Beeson, C. M. WELL COMPLETION PRACTICES. PART III. WELL WASHING. *World Oil* 130, 88-90 (1950) *January.*

At the completion of rotary drilling there is mud in the hole. Some of it is suspended but some of it is jellied and caked. All deterrents to production should be removed as completely as possible without damaging the formation. The simplest washing operation is direct mud displacement by flushing. Although oil may be used in some cases, water or aqueous solutions are most commonly employed. Additives such as salts, acids and dispersants are normally used. Special mechanical operations such as surging may be employed. These operations are evaluated.

J. D. Parent

Calhoun, J. C., Jr. ENGINEERING FUNDAMENTALS: FLOW CAPACITIES OF WELLS. *Oil Gas J.* 48, 75 (1950) *January* 5.

The probable mechanisms whereby dynamiting, acidizing and pressure parting increase productivity of wells are presented.

J. D. Parent

Calhoun, J. C., Jr. ENGINEERING FUNDAMENTALS: PRESSURE PARTING OF FORMATIONS. *Oil Gas J.* 48, 85 (1950) *January* 12.

There are two theories of pressure parting: (1) the formation is fractured; and (2) the overburden is lifted. Rate of water injection vs. pressure of injection curves indicate a break when parting occurs, and water is injected more readily beyond this point as if a fissure is opened. However, injection can be brought back to normal behavior on lowering the pressure so that a safety valve type of operation is indicated. Also, the pressure of the overburden corresponding to parting corresponds roughly to that required for raising.

J. D. Parent

Goins, C., Jr. A STUDY OF LIMED MUD SYSTEMS. *Oil Gas J.* 48, 52-54, 72 (1950) *January* 19.

The composition, manner of usage and advantages of limed drilling mud systems are presented.

J. D. Parent

Hoylman, H. W. AIRBORNE MAGNETOMETER PROFILES. *Oil Gas J.* 48, 55-57, 77-78 (1949) *December* 29.

Some experimental magnetometric aerial surveys made by Fairchild Aerial Surveys Inc.

across Cuyama Valley are reported and interpreted.

J. D. Parent

Muskat, M. SOME THEORETICAL ASPECTS OF CYCLING. *Oil Gas J.* **48**, 55-56, 58, 60 (1950) *January* 19.

Some theoretical problems in cycling studies are discussed. Optimum distribution pattern of injection wells and the effects of uniformity and stratification on recovery are considered.

J. D. Parent

Owsley, W. D. IMPROVED CASING CEMENTING. *Oil Gas J.* **48**, 76-78 (1949) *December* 15.

Recent developments in casing cementing practices are discussed. Topics included are: (1) mechanical means for well-bore mud removal; (2) use of bottom plugs; (3) advantages of Bentonite in cement mixtures; and (4) stage cementing.

O. T. Bloomer

Stekoll, M. H. THEORY AND PRACTICE OF WATER-FLOOD OPERATIONS. *World Oil* **130**, 158, 160, 164 (1950) *January*.

The basic simple theory of secondary recovery of oil by water flooding is given.

J. D. Parent

Watson, M. S., Jr. and Gooch, F. W., Jr. INTERPRETATION OF FIELD DATA ON THE BASIS OF RELATIVE PERMEABILITY RATIOS. *World Oil* **130**, 135-138, 140, 142, 144, 146 (1950) *January*.

The concept of relative permeability ratio (relative permeability to gas divided by the relative permeability to oil) is applied in an analysis of the field performance of three gas-driven fields. Methods of plotting the field data are presented which may be of use in predicting future reservoir performance.

O. T. Bloomer

NEW TEXAS CYCLING PLANT OPERATED BY STANOLIND. *Petroleum Refiner* **29**, 132-133 (1950) *January*.

This is an extremely brief coverage of a new cycling plant with design capacity of 166 MMcf per day with 330,000 gallons liquid recovery. Absorbers function at 1600, 800 and 200 psi. A dual still is employed. Steam requirements are 81,000 lbs per hr. Gas is recompressed to 3400 psi for injection.

J. D. Parent

Purification

Connors, J. S. and Miller, A. J. OPERATING PROBLEMS IN GAS TREATING FOR HYDROGEN SULFIDE REMOVAL. *Petroleum Processing* **5**, 29-31 (1950) *January*.

Operating problems in the removal of hydrogen sulfide from gas are discussed. Particular attention is given to amine type gas treaters. The principal operating problem is corrosion, which in general is caused by impurities in the solution. Methods that have been effective in the removal or control of impurities are discussed. Some data on the maintenance of iron oxide treating equipment is also given.

O. T. Bloomer

Meyers, C. O. PROCESS FOR THE REMOVAL OF ACIDIC MATERIAL FROM A GASEOUS MIXTURE. U.S. 2,487,576 (1949) November 8.

To minimize carry-over of absorption medium in processes for removal of acidic components of gases, such as the Girbotol type of process for sweetening natural gas, it is claimed that washing of the gaseous effluent is effective. A few added trays at the top of the absorber can be used for this purpose.

J. D. Parent

SKELLY REMOVES H_2S FROM SOUR GAS AT EUNICE. *Petroleum Refiner* **29**, 135-136 (1950) *January*.

Casinghead gas is treated by the amine process for removal of H_2S and CO_2 so that the gas and liquid products subsequently recovered are sweet. A flow sheet is given. Plant capacity is 64 MMcf per day.

J. D. Parent

Transmission

Baird, R. C. and Bechtold, I. C. MECHANICAL VIBRATION OF PIPING INDUCED BY GAS-PRESSURE PULSATIONS. *Trans. Am. Soc. Mech. Engrs.* **71**, 989-995 (1949) *November.*

The generation and nature of gas-pressure pulses from reciprocating compressor action are described, together with the propagation of such pulses through pipe lines. The means whereby pulse energy is converted to mechanical vibration is discussed by the aid of analogous mechanical, acoustical, and electrical oscillatory systems. The economic importance of minimizing vibration in compressor and compressor-dependent installations is indicated.

Authors' abstract

Dawson, J. H. THROUGH-FLOW DESURGER MINIMIZES LINE SHOCK. *World Oil* **129**, 192-194, 196, 198, 200 (1949) *December.*

Results of tests to determine the efficiency of a new type of surge eliminator are presented. The device consists of a balanced annular sleeve fastened around a length of the pipe in which water hammer or other pressure surges are to be eliminated. A series of small orifices connect the line to the interior of the annular sleeve. The exterior of the sleeve is loaded with air pressure to balance the normal operation pressure. Considerable advantage of this device over air domes or other methods of reducing surges is claimed.

O. T. Bloomer

Jacobson, H. A. PRACTICAL ASPECTS OF ORIFICE METER CALCULATIONS. *World Oil* **130**, 177-180, 182 (1950) *January.*

Working formulas for orifice meter calculations are reviewed. A simplified method for calculating the flow coefficient and correction terms is presented. The need for assembling and correlating data on accuracy and errors is emphasized. Some installation suggestions are given.

O. T. Bloomer

Yates, C. F. EFFECT OF PULSATION ON GAS MEASUREMENT. *Gas Age* **104**, 25-30 (1949) *December* 22.

A model system is described in which some qualitative data on the effect of pulsation on gas measurement with orifice meters have been obtained. It is concluded: (1) that pulsative flow of constant amplitude and frequency will record a smooth but high differential trace; (2) the presence of "beat" phenomena will record a differential trace which follows the envelope of such fluctuations, producing a wide irregular trace; (3) the greatest error appears when the differential pressure is varying continuously upwards.

O. T. Bloomer

The following articles, the abstract for which appear on the pages indicated, are also called to your attention:

Grumer, J. PREDICTING BURNER PERFORMANCE WITH INTERCHANGED FUEL GASES. p. 19

Johnson, G. B. GAS CONVERSION EXPERIENCES. p. 22

Kalff, A. A NEW PLUG COCK. p. 22

Mackie, F. D. DISTRIBUTION SYSTEM IS SECTIONALIZED FOR CONVERSION TO NATURAL GAS. p. 22

Menaul, P. L. MITIGATION OF OIL FIELD CORROSION. p. 30

Todd, R. DETAILS OF CONVERSION OF ATMOSPHERIC COOLING TOWER TO INDUCED-DRAFT OPERATION. p. 34

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Catalytic Cracking

Schall, J. W., Dart, J. C. and Kirkbride, C. G. MOVING BED CATALYTIC CRACKING CORRELATIONS. *Chem. Eng. Progress* **45**, 746-754 (1949) *December.*

Data from a moving bed catalytic cracking pilot plant unit have been correlated.

C. H. Riesz

Corrosion

Menaul, P. L. MITIGATION OF OIL FIELD CORROSION. *World Oil* **130**, 152-154, 157 (1950) *January.*

The causes of corrosion in oil fields and the protective measures mitigating these causes are discussed. The use of formaldehyde as an inhibitor is discussed.

B. E. Hunt

Fischer-Tropsch Synthesis

Oberfell, G. G. (assigned to Phillips Petroleum Co.) SYNTHESIS OF HYDROCARBONS. U.S. 2,490,463 (1949) December 6.

Mercury is introduced as an internal, direct coolant to control catalyst temperatures in the synthesis of hydrocarbons from carbon monoxide and hydrogen with a fixed-bed catalytic converter.

C. H. Riesz

Stewart, S. G. (assigned to Phillips Petroleum Co.) HYDROCARBON SYNTHESIS CATALYST. U.S. 2,490,488 (1949) December 6.

Molybdenum sulfide promoted with a minor proportion of an alkaline promoter such as potassium hydroxide, is claimed for the hydrogenation of carbon monoxide into normally liquid hydrocarbons.

C. H. Riesz

Hydrogenation

Sherwood, P. W. HIGH-PRESSURE HYDROGENATION OF CARBONACEOUS MATTER. PART I. INTRODUCTION. *Petroleum Refiner* **28**, 97-101 (1949) *December.*

The present industrial status of the high pressure hydrogenation process is surveyed. Its history from Bergius' discovery in 1911, through the advent of the catalytic process after 1930 and developments in Germany, England and elsewhere are reviewed. A flow scheme is outlined and discussed.

C. H. Riesz

MISSOURI PLANT TURNS FIRST COAL INTO GASOLINE. *Oil Gas J.* **48**, 83 (1949) *December* 29.

A continuous 7-week run has been completed by the Coal Hydrogenation Demonstration Plant at Louisiana, Missouri. The test was terminated on December 2, 1949.

C. H. Riesz

Production

Mills, K. N. GAS LIFT EVALUATION AND APPLICATION. *World Oil* **129**, 145-148 (1949) *November.*

Various types of gas lift systems used to produce oil wells are briefly described. Factors to be evaluated in application of gas lift operations are outlined. An alignment chart for estimating the efficiency of gas lift operations is included.

O. T. Bloomer

Synthesis Gas

Riblett, E. W. (assigned to Hydrocarbon Research Inc.) GENERATION OF SYNTHESIS GAS. U.S. 2,491,518 (1949) December 20.

Conditions favorable to generating synthesis gas under pressure are claimed. Hydrocarbon and oxygen (above 95% purity) are preheated above 600° F, preferably to about 1000° F. These reactants are then passed into a reactor maintained at temperatures between 2000 and 3000° F and at pressures in the range of 100 to

500 psi gauge. Contact time in the reactor lies within the range of 1 to 20 seconds.

C. H. Riesz

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Cattell, R. A. et al. REPORT OF PETROLEUM AND NATURAL GAS BRANCH. FISCAL YEAR 1948. p. 24

7. ANALYTICAL METHODS AND TESTS

Carbon Monoxide

Minchin, L. T. ESTIMATION OF CARBON MONOXIDE. *Gas. J.* (British) **260**, 719, 720 (1949) *December* 21.

The author briefly describes the development of a portable CO indicator based on measurement of the length of stain produced when a column of silica gel impregnated with a palladium salt is exposed to a fixed volume of gas containing CO. It is claimed that the apparatus will detect CO in concentrations as low as 0.001% and that only two minutes are required to complete a determination. Precautions to be observed to insure reliable results when using the apparatus are discussed along with the various applications found for the apparatus in the gas industry. This CO indicator is manufactured and is commercially available.

H. Hakewill

Thomas, P. R., Donn, L. and Levin, H. DETERMINATION OF CARBON MONOXIDE IN HYDROCARBON GASES CONTAINING OLEFINS. *Anal. Chem.* **21**, 1476-1480 (1949) *December*.

Apparatus and procedure are described for the separation of condensable gases from non-condensable gases by condensation with liquid nitrogen. In this manner uncondensed gases, including CO, H_2, N_2, O_2, and CH_4, may be removed from the condensed fraction by means of a Topler pump. Orsat apparatus is employed for the removal of O_2 from the non-condensable fraction and for the determination of CO by absorption in acid cuprous chloride and cuprous sulfate-2-naphthol solutions. The authors claim that use of this method overcomes interference due to the presence of olefinic hydrocarbons and data is presented to illustrate the degree of interference encountered when employing the usual methods for CO analysis and the improved accuracy attainable when employing their procedure. It is stated that the method is applicable for CO concentrations ranging from 0.1 to 100% and that the total time required for the determination is less than an hour.

H. Hakewill

Abstractor's Note: The method described for CO determination is of interest, but experience at the Institute of Gas Technology with oleum, bromine water, and mercuric sulfate as reagents for ethene removal prior to CO determination does not bear out the erratic results reported for the application of these reagents by the authors. Also, it has been found that the oxidation of CO to CO_2 by passage over heated CuO promoted with cerium oxide or iron oxide, subsequent to olefin removal by absorption with any of the foregoing reagents, yields accurate and reproducible results without requiring the rather elaborate equipment described by the authors and without subjecting the results to error due to incidental CH_4 absorption in the CuCl reagent employed by the authors for CO absorption.

Liquid Sampling

Friedel, R. A., Sharkey, A. G., Jr. and Humbert, C. R. LIQUID SAMPLING FOR ANALYSIS BY MASS SPECTROMETER. *Anal. Chem.* **21**, 1572-1573 (1949) *December*.

The use of a self-filling micro-pipet is described for introducing liquid mixtures into the mass spectrometer. Volumes of the order of 0.001 ml. are delivered with 1% error, and the sample may be used for calibration purposes with appreciable saving in time.

S. Katz

Michrochemical Analysis

Steyermark, A., Alber, H. K., Aluise, V. A., Huffman, E. W. D., Kuck, J. A., Moran, J. J. and Willits, C. O. REPORT ON RECOMMENDED SPECIFICATIONS FOR MICROCHEMICAL APPARATUS. *Anal. Chem.* **21**, 1555-1565 (1949) *December.*

Recommended specifications for microchemical apparatus to be used in connection with the carbon-hydrogen, Dumas nitrogen, halogen, and sulfur determinations published by the Committee for the Standardization of Microchemical Apparatus of the American Chemical Society were revised and are being extended by a new committee from the Division of Analytical and Microchemistry to cover other items of quantitative micro-, semimicro-, and ultramicro-apparatus and qualitative apparatus in these fields. The present report includes both the unchanged and revised recommended specifications, so that all may be together for easy reference.

H. Hakewill

Water

Roberts, F. M. and Levin, H. DETERMINATION OF SMALL AMOUNTS OF WATER. *Anal. Chem.* **21**, 1553-1555 (1949) *December.*

A method, employing azeotropic distillation and subsequent determination of the water in the distillate by titration with Karl Fischer reagent, has been applied to samples of oils, greases, deposits, additive concentrates, etc., containing as little as 0.0002% of water. The determination is made in a special distillation system protected from atmospheric moisture, after the system has been dried by partial distillation of the azeotrope former used in the analysis itself. The method is accurate to 0.3 mg. of water.

Authors' abstract

8. GENERAL AND PHYSICAL CHEMISTRY

Catalysts

Maxted, E. B. and Moon, K. L. STUDIES ON THE NATURE OF CHEMISORPTIVE BONDS. PART II. THE CATALYTIC TOXICITY OF ORGANOMETALLIC COMPOUNDS. *J. Chem. Soc.* (British) **1949**, 2171-2174 (September)

The toxicity of organometallic compounds in poisoning a platinum catalyst used for the hydrogenation of cyclohexene has been determined. The results indicate that the d shell in toxic metals is involved in the bond to the catalyst. Tetramethyl lead although poisonous was less toxic than dimethyl mercury. Trimethyl indium appeared to be highly toxic.

C. H. Riesz

Oxygen Reduction

Patrick, W. A. and Wagner, H. B. MECHANISM OF OXYGEN REDUCTION AT AN IRON CATHODE. *Corrosion* **6**, 34-38 (1950) *January.*

The results of laboratory experiments indicate that hydrogen peroxide is the primary reaction product at the iron cathode when oxygen is reduced.

B. E. Hunt

Phase Equilibria

Reamer, H. H., Fiskin, J. M. and Sage, B. H. PHASE EQUILIBRIA IN HYDROCARBON SYSTEMS. *Ind. Eng. Chem.* **41**, 2871-2875 (1949) *December.*

The equilibrium composition between the liquid and vapor phase of a methane-n-butane-decane system experimentally obtained at 160°F is presented in both graphical and tabulated form. The procedure and apparatus of the investigation are described in detail. Also included are interpolated pressure tables at 160°F, charts and tables showing influence of addition of two other hydrocarbon components upon the equilibrium constant of a pure hydrocarbon component.

S. Mori

Sulfur Properties

Barrow, G. M. and Pitzer, K. S. THERMODYNAMIC PROPERTIES OF SOME SULFUR COMPOUNDS. *Ind. Eng. Chem.* **41**, 2737-2740 (1949) *December.*

Thermodynamic properties of methyl and ethylmercaptan, dimethyl sulfide, sulfur dioxide, sulfur trioxide, hydrogen sulfide and sulfur have been compiled or computed by statistical methods. Entropies, free energy function, heat capacity and heat content function are reported between 298.16°K and 1000°K. Heats of formation of these substances, and also diethyl sulfide, n-propyl mercaptan, dimethyl sulfoxide and dimethyl sulfone are also reported, as well as the estimated equilibrium constants of a number of related reactions. The need for additional thermochemical data on the organic sulfur compounds is indicated.

S. Katz

Thermal Conductivity

Stops, D. W. EFFECT OF TEMPERATURE UPON THE THERMAL CONDUCTIVITY OF GASES. *Nature* (British) **164**, 966-967 (1949) *December* 3.

The thermal conductivities of air, nitrogen and carbon dioxide were found to fit a cubic parabolic relation with respect to temperature between 0-1000°C. The normal types of viscosity-temperature formulae were found inoperative above 600°C.

S. Katz

Thermodynamics

Edmister, W. C. APPLICATION OF THERMODYNAMICS TO HYDROCARBON PROCESSING. PART XXV.—PROPERTIES OF VAPOR AND LIQUID FROM EQUILIBRIUM FLASH VAPORIZATION OF PETROLEUM FRACTIONS. *Petroleum Refiner* **28**, 140-145 (1949) *December.*

The concluding article in this series presents a discussion of methods of determining empirically the API gravities and ASTM distillation curves of the vapor and liquid products of equilibrium flash vaporization of petroleum fractions.

S. Katz

Waddington, G., Smith, J. C., Scott, D. W. and Huffman, H. M. EXPERIMENTAL VAPOR HEAT CAPACITIES AND HEATS OF VAPORIZATION OF 2-METHYLPENTANE, 3-METHYLPENTANE AND 2, 3-DIMETHYLBUTANE. *J. Am. Chem. Soc.* **71**, 3902-3906 (1949) *December.*

Experimental vapor heat capacities and heats of vaporization have been determined for 2-methylpentane, 3-methylpentane and 2, 3-dimethylbutane using a flow calorimeter. The heat capacities are found to be in fair agreement with those computed by statistical methods for API Project 44. The paper also gives values for the second virial coefficients and entropies.

S. Katz

Viscosity

Grunberg, L. and Nissan, A. H. MIXTURE LAW FOR VISCOSITY. *Nature* (British) **164**, 799-800 (1949) *November* 5.

A modification of the Arrhenius equation for the viscosity of a solution takes the form

$$\log v_s = N_1 \log v_1 + N_2 \log v_2 + N_1 N_2 d$$

where v_s, v_1 and v_2 are the viscosities of the solution and its components, N_1 and N_2 are the mole fractions of the components. The constant d is found to be positive for systems showing a negative deviation from Raoult's law and negative where the deviation is positive.

S. Katz

10. CHEMICAL ENGINEERING

Cooling Towers

Baker, H. R., Jr. and Long, G. T. HOW TO TEST AND MAINTAIN COOLING TOWERS. *Chem. Ind.* **65**, 892-894 (1949) *December.*

The author illustrates the procedure to be followed in checking the performance of a water cooling tower. In cool weather, horsepower economies can be obtained by reducing the fan speed, fan pitch or shutting down the fans entirely. The mechanical equipment, the water system, and the structure should be checked periodically.

W. J. Merwin

Todd, R. DETAILS OF CONVERSION OF ATMOSPHERIC COOLING TOWER TO INDUCED-DRAFT OPERATION. *Oil Gas J.* **48**, 46-47, 73 (1950) *January* 5.

Pacific Lighting Corporation converted an atmospheric type cooling tower to induced draft operation. Details are given. The conversion was necessitated by extremely high windage loss and the local limited water supply.

J. D. Parent

Equilibrium Constants

Smith, K. A. and Smith, R. B. VAPORIZATION EQUILIBRIUM CONSTANT AND ACTIVITY COEFFICIENT CHARTS. *Petroleum Processing* **4**, 1355-1360 (1949) *December.*

A method is described for predicting vapor liquid equilibrium at high pressures where use of conventional equilibrium ratio ($K = y/x$) charts may give rise to large errors. "Activity coefficient" charts are presented which permit corrections to be made at higher pressures where deviations occur. It is claimed that the use of these correction charts will give average deviations of 15% or less even in the retrograde region. Working charts are not presented in this article but may be obtained from the publishers of *Petroleum Processing.*

O. T. Bloomer

Fractionation

Berg, L. and Popovac, D. O. EFFECT OF REDUCED PRESSURE ON EFFICIENCY OF A PACKED RECTIFICATION COLUMN. *Chem. Eng. Progress* **45**, 683-691 (1949) *November.*

A study is presented of the effect of reduced pressure on the efficiency of a packed rectification column. A test mixture of n-octane-toluene was used. Vapor-liquid equilibrium was determined for this system at eight pressures from 20 mm to 760 mm Hg abs. The column was run at total reflux and at reflux ratios of 30:1 and 20:1 for each of the eight pressures. In each case it was determined that the number of theoretical plates to give the separation obtained was between 11 and 14. This indicates that the column efficiency is independent of pressure.

O. T. Bloomer

Abstractor's Note: The n-octane-toluene system seems to have considerable merit as a test mixture for calibrating short columns.

May, J. A. MINIMUM REFLUX RATIO FOR MULTICOMPONENT DISTILLATION. *Ind. Eng. Chem.* **41**, 2775-2782 (1949) *December.*

A method is presented for the precise calculation of minimum reflux ratio for multicomponent distillation based upon the resolution of the multicomponent mixture into an equivalent series of binary mixtures. Within the limitations of constant molal overflow and constant relative volatility, this method holds for all feed conditions and can be applied to all types of separations except those involving "split keys." Although it becomes somewhat time-consuming for the general case, it is particularly adaptable to situations wherein the feed is a saturated liquid or a saturated vapor ($q = 1$ or $q = 0$) and there are no components present lighter than the light key or else heavier than the heavy key.

Author's Abstract

Underwood, A. J. V. FRACTIONATION DISTILLATION OF MULTICOMPONENT MIXTURES. *Ind. Eng. Chem.* **41**, 2844-2847 (1949) *December.*

A method of computing the number of transfer units required for a given separation by fractional distillation of multicomponent systems is given for the case of fixed relative volatility and constant molal reflux.

J. D. Parent

Heat Transfer

Morgan, A. I., Bromley, L. A. and Wilke, C. R. EFFECT OF SURFACE TENSION ON HEAT TRANSFER IN BOILING. *Ind. Eng. Chem.* **41**, 2767-2769 (1949) *December.*

A study of heat transfer coefficients to boiling liquids was made to observe the effect of surface tension. Runs were made with water and aqueous solutions of 0.1% Drene, 1% Drene and 1% sodium lauryl sulfonate. Results are considered qualitative rather than quantitative. The study indicates that heat transfer coefficients in boiling are governed more by the surface tension of fresh surfaces rather than by the "old age" or equilibrium values. Below the critical temperature difference, decreasing the surface tension increases the coefficient. The critical point is lowered as the surface tension is lowered.

C. L. Tsaros

Williams, G. C., Stigger, E. K. and Nichols, J. H. A CORRELATION OF PLATE EFFICIENCIES IN FRACTIONATING COLUMNS. *Chem. Eng. Progress* **46**, 7-16 (1950) *January.*

In this article and the appended discussion there is a resumé of all of the known facts concerning factors affecting the overall efficiency of plate type fractionators.

J. D. Parent

Pilot Plants

Sittig, M. PETROLEUM PROCESSING PILOT PLANTS. *Petroleum Processing* **4**, 1341-1343 (1949) *December.*

A literature survey is presented on pilot plants. Brief mention is given to pilot plants on fluidized catalytic cracking, moving bed catalytic cracking, suspensoid cracking, hydroforming, thermal cracking, alkylation, lube oil refining, and petrochemicals.

W. J. Merwin

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Baird, R. C. and Bechtold, I. C. MECHANICAL VIBRATION OF PIPING INDUCED BY GAS-PRESSURE PULSATIONS. p. 29

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Control Valve

Pellettere, J. A. CONTROL VALVE—ITS APPLICATION. *Oil Gas J.* **48**, 58-61 (1949) *December* 8.

The author divides control valve applications into three classes: (1) the case where the valve is the total load; (2) the case where the valve is only part of the load; and (3) the case where the control valve is an auxiliary device, such as steam-turbine governor, and thereby constitutes none of the load. A linear valve plug characteristic is recommended for the first class and a logarithmic valve plug characteristic is recommended for the second class. In each of these cases some portion of energy is wasted as pressure loss through the valve. By use of an auxiliary device, this can be avoided. Diagrams are presented showing typical applications.

W. J. Merwin

Corrosion

Wakefield, J. E. METALLIZING FOR CORROSIVE PREVENTION. *Iron Age* **165**, 55-60 (1950) *January* 12.

The thickness of a protective metal may be from 5 to 7 times the thickness produced by hot dipping and similar processes. This increased thickness results in a longer useful life of the protected metal.

B. E. Hunt

Heat Exchanger

Williams, R., Jr. A. D. LITTLE'S NEW HEAT EXCHANGER. *Chem. Eng.* **56**, 104-107 (1949) *December.*

Pictures and sketches are presented of a perforated plate type of heat exchanger intended for use in oxygen plants. The unit is 9 ft high, 3 ft across and 7 in. deep and can handle 3000 lb/hr of air. Overall heat transfer rates as high as 237 on gas to gas service have been obtained.

W. J. Merwin

Temperature Measurement

Farrar, G. L. and Platt, A. M. SOME FUNDAMENTALS OF TEMPERATURE MEASUREMENTS WITH THERMOCOUPLES. *Petroleum Engr.* **21C**, 5-10 (1949) *December.*

The elementary theory of thermocouples is presented, and the fundamental and measuring circuits are discussed.

W. J. Merwin

Smith, L. E. HEAT-CONDUCTION ERRORS IN TEMPERATURE MEASUREMENTS. *Trans. Am. Soc. Mech. Engrs.* **72**, 71-76 (1950) *January.*

Where a temperature-sensitive bulb is rigidly attached to a containing vessel, heat-conduction errors must be accounted for. In order to determine the magnitude of this error, several combinations of thermometer bulb and nonsensitive extensions to the point of attachment were tested. Three bulbs, one of copper and two of 18-8-stainless steel, with both finned and plain extensions, were used. Response tests were conducted in both water, a high heat transfer medium, and air, a low heat transfer medium. Care must be taken when testing a thermometer system with a sensitive bulb in one well by comparison with a mercury-in-glass test thermometer in another well having a different extension-conduction error, since differences may not indicate actual discrepancies. Agreement, on the other hand, may mean simply that similar conduction errors apply. The magnitude of the extension conduction error must be known to determine exact performance of the thermometer system. Insulating the thermometer head and its containing vessel is the best way to overcome the effects of heat conduction.

C. L. Tsaros

Ziegler, J. G. and Nichols, N. B. DYNAMIC ACCURACY IN TEMPERATURE MEASUREMENTS. *Instruments* **23**, 66-69 (1950) *January.*

All practical temperature sensing elements are imperfect for dynamic temperature measurements because of the time lag factor arising from the temperature difference between fluid and element. Knowing the rate of temperature change of the fluid to be measured $dT/d\theta$, the heat transfer coefficient between fluid and element h, the heat capacity C and area A of the temperature element, it is possible to approximate (a) the time lag factor Z of the system from the equation

$$Z = C/Ah$$

and (b) the error ΔT between fluid and sensing element from the relation

$$\Delta T = (C/Ah)(dT/d\theta) = Z(dT/d\theta).$$

The time lag of the measuring system can be decreased by (a) the use of elements of low C/A values and (b) temperature compensation. In the latter method a value is obtained for the temperature derivative $dT/d\theta$ which is proportional to the error ΔT, and the result after multplication by a calibration constant is added to the temperature indication of the sensing element. A simple circuit utilizing a balanced air pressure system for temperature compensation is described.

C. Von Fredersdorff

12. MATERIALS OF CONSTRUCTION

Furnace Tubes

Gulbransen, E. A. and Andrew, K. F. MULLITE AND ZIRCON FURNACE TUBES FOR HIGH TEMPERATURE AND HIGH VACUUM SYSTEMS. *Ind. Eng. Chem.* **41**, 2762-2767 (1949) *December.*

A study of the properties of synthetic mullite and zircon tubes for high temperature and high vacuum service is described. Both ceramics may be sealed directly to Pyrex glass, and pressure of 10^{-6} mm. Hg. at 1175 C are possible.

S. Katz

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Transactions of the Faraday Society
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